CLINICAL ARTICLE

Endodontic and orthodontic treatment of a cross-bite fused maxillary lateral incisor

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Abstract

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Aim To describe combined endodontic and orthodontic treatment of a maxillary lateral incisor fused with a supernumerary.

Summary A rare case is presented in which combined endodontic and orthodontic treatment was performed on a cross-bite fused tooth. Clinical and radiographic examination showed the maxillary lateral incisor fused with a supernumerary and an impacted canine. The fused tooth required nonsurgical and surgical endodontic treatment for functional and aesthetic reasons. The root canals were dressed with calcium hydroxide for 2 months before they were obturated with thermoplasticized injectable gutta-percha. Then, the distal part of the fused tooth was removed and the mesial part of the tooth was replanted and fixed. Three months after the completion of orthodontic therapy, the impacted canine erupted between the remaining tooth and the first premolar. Recall examination, 3 years after completion of root canal treatment, showed clinical and radiographic evidence of healing.

Key learning points

- Fusion has been described as a development anomaly characterized by the union of two adjacent teeth.
- Proper combined endodontic and orthodontic treatment resulted in maintaining one tooth half and solving the aesthetic and functional problem of a fused tooth.

Keywords: fused tooth, hemisection, maxillary lateral incisor, root canal treatment, root resorption.

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Introduction

Fusion is defined as a union of two separate tooth buds at some stage in their development. The pulp chamber and root canal may be joined or separated, depending on the stage of development at the time of union (Duncan & Helpin 1987). The aetiology of this phenomenon is unknown. Shafer *et al.* (1983) suggested that physical force or pressure leading to prolonged contact of the adjacent tooth follicles causes fusion of buds. Gemination, sometimes called 'twinning' is a similar dental anomaly and is defined as an attempt of the tooth bud to divide (Braham 1995). In some instances, it is difficult to differentiate between fusion of a permanent tooth with a supernumerary tooth and gemination of a single tooth. Clinically, both types of tooth anomaly may result in functional and aesthetic problems and thus may require some kind of endodontic, prosthetic, surgical and/or orthodontic treatment. Variations in the fused tooth morphology present a clinical challenge when endodontic treatment is required (Budd *et al.* 1992).

This case report describes the endodontic and orthodontic management of a maxillary lateral incisor fused with a supernumerary.

Case report

A 10-year-old boy was referred for endodontic treatment of his maxillary right lateral incisor (tooth 12). The medical history was noncontributory. Clinical examination revealed that the

Figure 1 Preoperative view of the fused maxillary lateral incisor and the supernumerary tooth. Note the palatally dislocated teeth.

Figure 2 Preoperative palatal view of the fused maxillary lateral incisor.

maxillary lateral incisor was fused with a supernumerary and in cross-bite, and that the maxillary canine was missing from the dental arch (Figs 1 and 2). There was an extra crown of normal appearance adjacent to the right lateral incisor. No caries could be detected. Both teeth displayed physiological mobility, and responded within normal limits to electric pulp sensitivity testing. Radiographic examination demonstrated a fused tooth with two separate pulp chambers and two separate root canals connecting via a large fin in mid-root. The maxillary canine was impacted (Fig. 3). A decision was made to divide tooth 12 from the supernumerary to improve aesthetics and move tooth 12 out of cross-bite. Endodontic and orthodontic treatment was therefore initiated. After local anaesthesia and rubber dam isolation, working lengths were established (Fig. 4) and chemomechanical preparation performed with 2.6% sodium hypochlorite solution as irrigant. After drying the root canals

Figure 3 Preoperative radiograph of the fused maxillary lateral incisor showing two completely separated pulp chambers and roots. The communication of the pulp systems can be detected radiographically.

Figure 4 Periapical radiograph for determination of both working lengths.

with paper points, a calcium hydroxide paste was applied and the access cavities temporarily sealed with Cavit (ESPE, Seefeld, Germany). The patient returned after 2 months; the calcium hydroxide paste was removed and the root canals were obturated with injection-moulded thermoplasticized gutta-percha (Obtura II, Obtura Corp., Fenton, MO, USA) and zinc oxide–eugenol sealer (Canals, Showa Yakuhin, Tokyo, Japan). A postoperative radiograph was taken (Fig. 5). Three weeks later, the patient reported that he had been completely without symptoms. The fused tooth was anaesthetized and buccal and palatal flaps were raised. The fused tooth was extracted (Fig. 6) and kept in a moist condition with normal saline solution. The tooth was held gently by the crown with wet gauze during the procedure of dividing with a diamond bur. The distal part of the fused tooth was removed. At this time the communication between root canals was exposed. Inspection of the exposed pulp fin area indicated well-adapted gutta-percha and sealer, requiring no additional preparation or seal. The mesial part of the tooth was then replanted into its original site in the socket. Before replantation, blood clot was aspirated from the socket, and the replanted tooth was rinsed with saline to remove all debris. The entire time from extraction to replantation was 20 min. The replanted tooth was splinted to adjacent

Figure 5 Radiograph immediately after obturation of root canals. The communication of the pulp systems is evident.

Figure 6 The extracted fused maxillary lateral incisor.

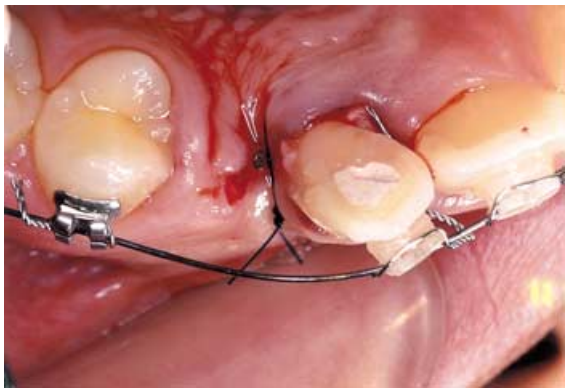

Figure 7 Palatal view of the mesial part of the tooth following suturing.

Figure 8 Radiograph immediately after the fixation.

Figure 9 Orthodontic extrusion of the impacted canine.

Figure 10 Radiograph taken after 2 years of active orthodontic therapy.

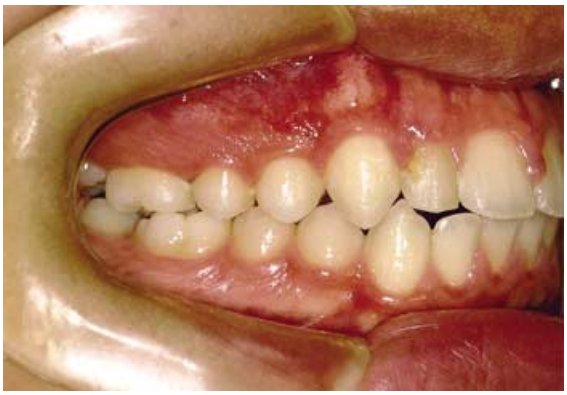

Figure 11 Clinical side view of maxillary lateral incisor after 3 years treatment. The alignment of the teeth is satisfactory.

teeth for 3 weeks (Figs 7 and 8). Three months later, the orthodontic appliances were put in place (Fig. 9). Three months after orthodontic treatment, the impacted canine erupted between the remaining tooth and the first premolar. The patient was recalled for periodic checkups and healing was uneventful (Fig. 10). The recall examination after 3 years revealed asymptomatic and healthy periodontal conditions (Figs 11 and 12).

Discussion

Clinically, it may be difficult to differentiate between fusion and gemination when a supernumerary tooth is joined with a permanent tooth. However, there is no clinical value in differential diagnosis of fusion and gemination. Mader (1979) suggested that all permanent successors that are joined or fused together by dentine be referred to as fused teeth because of the frequent difficulty in differentiating fusion from gemination in the permanent dentition. A preoperative radiograph showed two almost completely separated pulp chambers and roots. Separation of the fused tooth was required to correct the palatally dislocated incisors and to establish an aesthetic and functional occlusion. Hemisection is

Figure 12 Three-year follow-up radiograph of maxillary lateral incisor, showing external root resorption.

defined as the division of a tooth in half and removal of the unwanted, diseased portion, together with its root. In this case, the fused tooth was extracted and the mesial part of the fused tooth was replanted. The separation and hemisection of the fused tooth into a single incisor would have been a possible treatment method as described in previous reports (Itkin & Barr 1975, Blank *et al*. 1985, Kayalibay *et al*. 1996). The point of crown and root separation is as important in determining the prognosis of a fused tooth as it is in determining the prognosis of a molar with furcation involvement. Teeth that are fused too far apically cannot be sectioned without disturbing a major part of the attachment apparatus on the root to be retained. Extraoral separation and hemisection procedures were performed to achieve smooth contours of the replanted tooth. Such contouring and inspection of the interconnecting fin may have been difficult if division had taken place *in situ*. In the present case, care was taken in the sectioning process to cut at the expense of the tooth to be discarded, thus preserving a normal shape on the retained tooth.

It has been advocated that if endodontic treatment is to be performed, orthodontic treatment should be postponed until completion of endodontic treatment and clinical and radiographic evidence of healing is seen. In this case, endodontic treatment was completed before the active orthodontic treatment was applied. Successful root canal treatment depends on thorough cleaning, shaping and complete obturation of the root canal system. Mechanical debridement of the root canals connecting via a large fin in mid-root was difficult, but the combination of chemomechanical instrumentation and the use of calcium hydroxide were sufficient. As calcium hydroxide has been reported to successfully dissolve pulp tissue remaining on the root canal wall (Wadachi *et al*. 1998), it was decided to treat the root canals with this medicament before obturating the root canal with gutta-percha. The use of a warm gutta-percha technique helped to obturate the root canal system, as it was possible to compact the softened material into the major irregularities within the root canal system (Budd *et al*. 1991, Gutmann 1993).

According to previous investigations (Andreasen & Kristerson 1981), ankylosis was expected on the denuded root surface because of the lack of periodontal membrane at the separated root surface. No treatment was considered helpful to encourage periodontal regeneration of the site. Most ankylosis is diagnosed within the first 2 years after replantation of human avulsed teeth (Andreasen *et al*. 1995). In the present case, 3 years after the replantation, ankylotic symptoms such as loss of periodontal space and possible root resorption were observed. However, there is no treatment for ankylosis at present. On

the other hand, there is potential for an eventual long-term periodontal problem because there was no covering bone and epithelial attachment over the separated root surface. Periodontal care will be an important issue for predicting long-term prognosis.

Conclusions

A case involving unusual pulpal morphology due to fusion was treated by combined endodontic and orthodontic treatment. At a 3-year follow-up, the fused tooth was clinically healthy and continued to satisfy aesthetic and functional demands.

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